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| 10/576,721 | 01/26/2007 | Yoshikatsu Seino | 290087US0PCT | 4373 |
| 22850 7590 10/06/2009 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314 | | | | |
| EXAMINER | | | | |
| MCALL, JOSEPH | | | | |
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| 1793 | | | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/576,721

Applicant(s)

SEINO ET AL.

Examiner

Joseph V. Micali

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date: _____

DETAILED ACTION

Status of Application

The amendments/argumentation filed on September 15th, 2009 have been entered.

Claims 1-16 are pending and presented for examination on the merits, as claims 9-16 have newly been added.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-4 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent 07-330312 by Koyama et al (See given Patent Abstract and translation provided by examiner), in view of US Patent No. 6,503,473 by Akiba.

With respect to claims 1-3, Koyama teaches obtaining a highly pure lithium sulfide by reacting lithium hydroxide with hydrogen sulfide in an aprotic organic solvent to produce the lithium hydrosulfide, and subsequently subjecting the reaction solution to a hydrogen sulfide-removing reaction, with an especially preferable solvent is N-methyl-2-pyrrolidone (NMP) **(Abstract, and claims 1-2).**

However, though Koyama discloses washing the obtained lithium sulfide with an aprotic organic solvent, such as NMP (**paragraphs 0037-0038**), Koyama is silent with regards to a washing temperature of 100° C or higher.

Akiba is drawn to a process for separating solid compounds other than lithium hydroxide **(title)**. Specifically, the process of Akiba regards bubbling gaseous hydrogen sulfide through an aprotic solvent containing solid lithium hydroxide to convert substantially all lithium hydroxide into a lithium hydrosulfide and then to lithium sulfide, where such a lithium sulfide product is further washing with a large amount of NMP at 100° C **(Comparative Example 2, for example)**.

At the time of invention it would have been obvious to a person of ordinary skill in the art to perform the process of Koyama including a washing step at 100° C or higher, in view of the teaching of Akiba. The suggestion or motivation for doing so would have been to select a

temperature that prevents high viscosity of the mixture, which would lead to poor washing efficiency (**Akiba, column 6, lines 20-24**).

With respect to claim 4, Koyama teaches in one of the examples, a lithium sulfide purity of no less than 99.8% (**paragraph 0037**), and thus, less than or equal to 0.2% impurity. The current claim limitation is a total impurity weight percent equal or less than to 0.25%.

With respect to claims 14-16, Koyama and Akiba, as combined, disclose NMP being the aprotic organic solvent being used in both reacting as well as washing, and with such a washing step, the NMP is at a temperature lower than its boiling point of 202-204° C (**Koyama, Abstract, and claims 1-2, and Akiba, Comparative Example 2**).

5. Claims 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent 07-330312 by Koyama et al (See given Patent Abstract and translation provided by examiner), in view of US Patent No. 6,503,473 by Akiba, and as evidenced by US Patent No. 6,455,022 by Delmas.

With respect to claim 9, the limitations of such a claim are either taught by Koyama or Akiba or would have been obvious to one having ordinary skill in the art, as the reaction step at a temperature of 0 to 150° C is disclosed by both Koyama and Akiba, such as at 130° C in Akiba (**Koyama, Abstract, and claims 1-2, and Akiba, Examples**), Akiba discloses use of filtration instead of decantation (**Examples**), which would have been a substitution of equivalent separation means easily recognized by one having ordinary skill in the art, with the benefit of filtration over decantation being greater efficiency and the benefit of decantation over filtration being faster separation. This is evidenced by the Delmas reference, which is drawn to the purification of alkali metal chloride solutions by the removal of a solids component through

known separation means, as the Delmas reference discloses filtration and decantation as equivalent separation means (**column 2, lines 65-67**), Akiba discloses adding the fresh NMP for washing and stirring at a temperature equivalent to the hydrosulfurization step (**Washing Step section**), and Koyama discloses drying (**paragraphs 0037-0038**) while Akiba discloses that the final steps could be conducted under an inert gas stream with the suggestion or motivation of preventing oxidation of the product to produce a sulfur oxide of lithium (**Washing Step section**).

With respect to claims 10-13, Koyama and Akiba, as combined, disclose no natural LMAB or sulfur oxide byproducts to the process, and furthermore, as Akiba discloses such a washing step with NMP at 100° C (**Comparative Example 2, for example**), such limited LMAB levels would have been expected.

6. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent 07-330312 by Koyama et al in view of US Patent No. 6,503,473 by Akiba, as applied to claims 1-4 and 9-16 above, and further in view of US Patent No. 6,022,640 by Takada et al.

With respect to claim 5, Koyama, as combined, is silent with regards to a purpose for the lithium sulfide and its use in a solid electrolyte for a lithium rechargeable battery.

Takada is drawn to a solid state rechargeable lithium battery. Specifically, Takada teaches using a lithium ion conductive solid electrolyte of inorganic compounds, one composed of sulfides, and of these electrolytes, those synthesized from mainly lithium sulfide are preferred (**column 8, lines 42-58**).

At the time of invention it would have been obvious to a person of ordinary skill in the art to produce the modified product of Koyama in a solid electrolyte form, in view of the teaching of

Takada. The suggestion or motivation for doing so would have been to create an electrolyte well-suited from large scale production, with attributes such as high ion conductivity and improved high rate capability of the battery (**Takada, column 8, lines 42-58**).

With respect to claim 7, Takada teaches the use of the solid electrolyte for a lithium rechargeable battery in a solid battery (**title, abstract, and column 8, lines 42-58**).

7. Claims 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Patent 07-330312 by Koyama et al in view of US Patent No. 6,503,473 by Akiba and US Patent No. 6,022,640 by Takada et al, as applied to claims 1-5, 7, and 9-16 above, and further in view of US Patent Pub No. 2004/0109940 by Kugai et al.

With respect to claim 6, though Takada discloses an improved ionic conductance in the solid electrolyte produce, the reference is silent as to a value of the ionic conductance.

Kugai is drawn to a method of producing a negative electrode for lithium secondary cells. Specifically, Kugai teaches an inorganic solid electrolyte in the form of a thin film having an ionic conductance of at least 1×10^{-4} S/cm, with a preferred range of 5×10^{-4} S/cm to 2.5×10^{-3} S/cm (**paragraph 0024**).

At the time of invention it would have been obvious to a person of ordinary skill in the art to produce the modified product of Koyama with the claimed ionic conductance, in view of the teaching of Kugai. The suggestion or motivation for doing so would have been to have an improved ionic conductance within the solid electrolyte for improved high rate capability of the battery (**Takada, column 8, lines 42-58**). **MPEP 2144.05 [R-5]** states, "In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists.

With respect to claim 8, Takada teaches the use of the solid electrolyte for a lithium rechargeable battery in a solid battery (**title, abstract, and column 8, lines 42-58**).

Response to Arguments

7. Applicant's arguments with respect to the current claim set have been considered but are moot in view of the new ground(s) of rejection.

Applicant's argumentation on the usage of Koyama alone does not stand, given examiner's use of the Akiba reference in the new rejection above. Thus, such grounds of argumentation are no longer persuasive. As for the secondary rejections, as examiner has addressed the problems of Koyama alone by use of the Akiba reference, such secondary rejections are maintained with the addition of Akiba.

Conclusion

8. Claims 1-16 are rejected.
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph V. Micali whose telephone number is (571) 270-5906. The examiner can normally be reached on Monday through Friday, 7:30am to 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry A. Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Joseph V Micali/
Examiner, Art Unit 1793

/J.A. LORENZO/
Supervisory Patent Examiner, Art Unit
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